

Challenge Problem

1. $\int \cos(3x) \, dx =$

(A) $-3 \sin(3x) + C$

(B) $-\frac{1}{3} \sin(3x) + C$

(C) $\frac{1}{3} \sin(3x) + C$

(D) $\sin(3x) + C$

(E) $3 \sin(3x) + C$

7. $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} \, dx =$

(A) $2e^{\sqrt{x}} + C$

(B) $\frac{1}{2}e^{\sqrt{x}} + C$

(C) $e^{\sqrt{x}} + C$

(D) $2\sqrt{x}e^{\sqrt{x}} + C$

(E) $\frac{1}{2} \frac{e^{\sqrt{x}}}{\sqrt{x}} + C$

13. $\int (x^3 + 1)^2 dx =$

(A) $\frac{1}{7}x^7 + x + C$

(B) $\frac{1}{7}x^7 + \frac{1}{2}x^4 + x + C$

(C) $6x^2(x^3 + 1) + C$

(D) $\frac{1}{3}(x^3 + 1)^3 + C$

(E) $\frac{(x^3 + 1)^3}{9x^2} + C$

3. $\int \sec x \tan x dx =$

(A) $\sec x + C$

(B) $\tan x + C$

(C) $\frac{\sec^2 x}{2} + C$

(D) $\frac{\tan^2 x}{2} + C$

(E) $\frac{\sec^2 x \tan^2 x}{2} + C$

1. $\int \left(5e^{2x} + \frac{1}{x} \right) dx =$

(A) $\frac{5}{2}e^{2x} + \frac{2}{x^2} + C$

(B) $\frac{5}{2}e^{2x} + \ln|x| + C$

(C) $5e^{2x} + \frac{2}{x^2} + C$

(D) $5e^{2x} + \ln|x| + C$

(E) $10e^{2x} - \frac{1}{x^2} + C$

3. $\int x^2 (x^3 + 5)^6 dx =$

(A) $\frac{1}{3}(x^3 + 5)^6 + C$

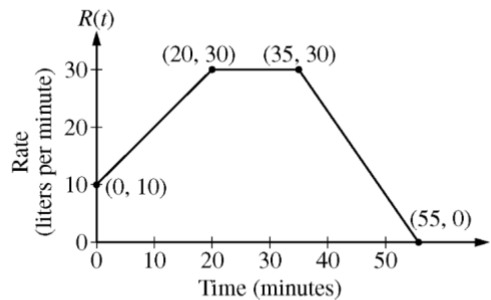
(B) $\frac{1}{3}x^3 \left(\frac{1}{4}x^4 + 5x\right)^6 + C$

(C) $\frac{1}{7}(x^3 + 5)^7 + C$

(D) $\frac{3}{7}x^2 (x^3 + 5)^7 + C$

(E) $\frac{1}{21}(x^3 + 5)^7 + C$

Problem 7.



1. At time $t = 0$ minutes, a tank contains 100 liters of water. The piecewise-linear graph above shows the rate $R(t)$, in liters per minute, at which water is pumped into the tank during a 55-minute period.
- (b) How many liters of water have been pumped into the tank from time $t = 0$ to time $t = 55$ minutes? Show the work that leads to your answer.